

Amendments to the Claims

This listing of claims replaces prior versions:

Claim 1 (Currently Amended): A beam source comprising:

a discharge tube;

a gas inlet for introducing gas into the discharge tube disposed on an upstream side of the discharge tube;

three electrodes mounted in the discharge tube downstream from the gas inlet, wherein the upstream electrode has a plurality of openings through which the gas can pass, the middle electrode is a mesh electrode, and the downstream electrode is a beam-emitting electrode having a plurality of beam-emitting holes and is disposed in a plane parallel to the middle electrode;

a plasma chamber formed between the upstream electrode and the mesh electrode, the upstream electrode and the mesh electrode connected by wiring for maintaining at approximately the same potential, and plasma-generating means disposed between the upstream electrode and the mesh electrode on the outside of the discharge tube for transforming gas introduced into the discharge tube into plasma; and

an accelerating chamber formed between the mesh electrode and the downstream electrode, the mesh electrode and the downstream electrode connected by another wiring to voltage-applying means device for accelerating the beam between the mesh electrode and the downstream electrode and emitting the accelerated beam from the downstream electrode;

wherein an accelerating voltage of 1 kV or less is applied between the mesh electrode and the downstream electrode, and the two electrodes on the downstream end are separated by a distance of 5 millimeters or greater.

Claim 2 (Canceled)

Claim 3 (Currently Amended): A beam source as claimed in claim 1, wherein the two electrodes on the downstream end are separated by a distance of ~~5 millimeters or greater, and preferably by a distance of 10-30 millimeters.~~

Claim 4 (Original): A beam source as claimed in claim 1, wherein each of the beam-emitting holes formed in the beam-emitting electrode on the downstream end has a length-to-diameter ratio of 2 or greater.

Claim 5 (Currently Amended): A beam source as claimed in claim 1, wherein the voltage-applying ~~means~~ device applies a positive-negative pulse-type voltage that alternately irradiates either positive ions and negative ions or positive ions and electrons.

Claim 6 (Previously Presented): A beam source as claimed in claim 1, wherein said thickness of said mesh electrode ranges 0.1 to 0.5 millimeters.

Claim 7 (Previously Presented): A beam source as claimed in claim 1, wherein an aspect ratio of holes provided in said mesh electrode is less than 1.

Claim 8 (Previously Presented): A beam source as claimed in claim 1, wherein said mesh electrode comprises a cross mesh.

Claim 9 (Previously Presented): A beam source as claimed in claim 4, wherein a wire thickness of said cross mesh is 0.3 millimeters and a space between wires is 0.8 millimeters.

Claim 10 (Previously Presented): A beam source as claimed in claim 1, wherein said mesh electrode has a thickness of no greater than 1 millimeter and has an open area ratio of 85% or less.

Claim 11 (Previously Presented): A beam source as claimed in claim 1, wherein said beam emitting electrode is set to zero potential.

Claim 12 (Currently Amended): A neutral particle beam source comprising:

a discharge tube;

a gas inlet for introducing gas into the discharge tube disposed on an upstream side of the discharge tube;

three electrodes mounted in the discharge tube downstream from the gas inlet, wherein the upstream electrode has a plurality of openings through which the gas can pass, the middle electrode is a mesh electrode, and the downstream electrode is a beam-emitting electrode having a plurality of beam-emitting holes and is disposed in a plane parallel to the middle electrode;

a plasma chamber formed between the upstream electrode and the mesh electrode, the upstream electrode and the mesh electrode connected by wiring for maintaining at approximately the same potential, and plasma-generating means disposed between the upstream electrode and the mesh electrode on the outside of the discharge tube for transforming gas introduced into the discharge tube into plasma; and

an accelerating chamber formed between the mesh electrode and the downstream electrode, the mesh electrode and the downstream electrode connected by another wiring to voltage-applying ~~means~~ device for accelerating a beam between the mesh electrode and the downstream electrode and emitting the accelerated beam from the downstream electrode;

wherein ~~either a positive ion beam and a negative ion beam or a positive ion beam and an electron beam can be irradiated alternately~~ charge exchange takes place in said beam emitting holes formed in the downstream electrode, resulting in an emission of a neutral particle beam.

Claim 13 (Currently Amended): A neutral particle beam source as claimed in claim 12, wherein the voltage applying ~~means~~ device applies a positive and negative pulse-type voltage.

Claim 14 (Currently Amended): A neutral particle beam source as claimed in claim 12, wherein ~~the two electrodes on the upstream end have the same potential, while~~ wherein the beam-emitting electrode on the downstream end has the same potential as that of a chamber into which the beam is emitted.

Claim 15 (Currently Amended): A neutral particle beam source as claimed in claim 12, wherein the two electrodes on the downstream end are separated by a distance of 5 millimeters or greater, and preferably by a distance of 10-30 millimeters.

Claim 16 (Currently Amended): A neutral particle beam source as claimed in claim 12, wherein each of the beam-emitting holes formed in the beam-emitting electrode on the downstream end has a length-to-diameter ratio of 2 or greater.

Claim 17 (Currently Amended): A neutral particle beam source as claimed in claim 12, wherein said thickness of said mesh electrode ranges 0.1 to 0.5 millimeters.

Claim 18 (Currently Amended): A neutral particle beam source as claimed in claim 12, wherein an aspect ratio of holes provided in said mesh electrode is less than 1.

Claim 19 (Currently Amended): A neutral particle beam source as claimed in claim 12, wherein said mesh electrode comprises a cross mesh.

Claim 20 (Currently Amended): A neutral particle beam source as claimed in claim 16, wherein a wire thickness of said cross mesh is 0.3 millimeters and a space between wires is 0.8 millimeters.

Claim 21 (Currently Amended): A neutral particle beam source as claimed in claim 12, wherein said mesh electrode has a thickness of no greater than 1 millimeter and has an open area ratio of 85% or less.

Claim 22 (Currently Amended): A neutral particle beam source as claimed in claim 12, wherein said beam emitting electrode is set to a zero potential.